

REMARKS

Claims 1-29 are currently pending in the subject application and are presently under consideration. Claims 1, 2, 7, 12, 16, 18, 20, 22 and 25-29 have been amended to further emphasize novel aspects of the invention and to correct minor informalities, as shown on pages 9-14 of the Reply. Claim 24 has been withdrawn. In addition, the specification has been amended to correct minor informalities, as indicated on pages 2-8 of the Reply.

Favorable reconsideration of the subject patent application is respectfully requested in view of the comments and amendments herein.

I. Rejection of Claims 18, 24, 26-27 Under 35 U.S.C. § 112

Claims 18, 24 and 26-27 stand rejected under 35 U.S.C. § 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regards as the invention. It is requested that the rejection be withdrawn for at least the following reasons: claims 18, 26 and 27, as amended, particularly point out and distinctly claim the subject matter which applicants regard as the respective inventions; and claim 24 has been withdrawn.

In reviewing a claim for compliance with 35 U.S.C. § 112, second paragraph, the examiner must consider the claim as a whole to determine whether the claim apprises one of ordinary skill in the art of its scope and, therefore, serves the notice function required by 35 U.S.C. § 112, second paragraph by providing clear warning to others as to what constitutes infringement of the patent. *See, e.g., Solomon v. Kimberly-Clark Corp.*, 216 F.3d 1372, 1379, 55 U.S.P.Q. 2d 1279, 1283 (Fed. Cir. 2000). The test for definiteness under 35 U.S.C. § 112, second paragraph is whether “those skilled in the art would understand what is claimed when the claim is read in light of the specification.” *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576, 1 U.S.P.Q. 2d 1081, 1088 (Fed. Cir. 1986).

Claim 18, as amended, is definite and particularly points out and distinctly claims the subject matter that applicants regard as the invention. As amended, claim 18 specifies that n is an integer and represents the number of requests within the round, and $service(n)$ represents the maximum latency period for servicing the requests within the round to

update the storage medium. The other variables in the equation are easily understood by those skilled in the art when read in light of the specification. (See Application, claim 18; page 1, lines 24-28; page 10, lines 11-20)

It is therefore clear that *service(n)*, which represents the maximum latency period to service a round of requests to update the storage medium, and which is determined based on *n*, the number of requests within the round, is functionally and structurally inter-coupled with the “disk scheduling system” of claim 1 in terms of accomplishing the function of claim 1. Claim 18 is therefore definite and particularly points out and distinctly claims the subject matter that applicants regard as the invention.

Based on the above, it is believed that claim 18 is in condition for allowance, and the rejection of this claim should be withdrawn.

With regard to dependent claim 24, it is withdrawn. The rejection of this claim is therefore moot and should be withdrawn.

As to dependent claims 26 and 27, claim 26 has been amended to properly refer back to claim 25, and dependent claim 27 has been amended to properly refer back to claim 26. Claims 26 and 27 are definite and particularly point out and distinctly claim the subject matter that applicants regard as the invention.

Based on the above, it is believed that claims 26 and 27 are in condition for allowance, and the rejection of these claims should be withdrawn.

II. Rejection of Claim 29 Under 35 U.S.C. § 101

Claim 29 stands rejected under 35 U.S.C. § 101 for allegedly failing to and/or being incapable of producing useful, concrete or tangible result(s) when used in a computer system. It is requested that the rejection be withdrawn for at least the following reason: Claim 29, as amended, claims subject matter that, as a whole, has been reduced to a practical application and is capable of producing useful, concrete or tangible results when used in a computer system.

The issue of patentability pursuant to section 101 requires an examination of the contested claims to see if the claimed subject matter, as a whole, has been *reduced to some practical application rendering it “useful.”* *AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352, 1357 (citations omitted) (emphasis added). The Supreme Court stated “when [a claimed invention] is performing a function which the

patent laws were designed to protect (e.g., transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101.” *Diamond v. Diehr*, 450 U.S. 175, 192 (1981). Thus, a claim should not be rejected under 35 U.S.C. § 101 unless it is devoid of any limitation to a practical application in the technological arts.

A claim directed to a computer-readable medium with a data structure stored thereon satisfies section 101 and may be patentable so long as it relates to functional descriptive material recorded on a computer-readable medium. When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and may be statutory since use of technology permits the function of the descriptive material to be realized. *See Bloomstein v. Paramount Pictures Corp.*, 1998 U.S. LEXIS 20839, *20-25 (N.D. Cal. March 10, 1998); *see also, e.g., In re Lowry*, 32 F.3d 1579, 1583-1584, 32 U.S.P.Q. 2d 1031, 1034-1035 (Fed. Cir. 1994) (court stating that board held as statutory a claim to a data structure stored on a computer readable medium that increased computer efficiency). Furthermore, a claimed computer-readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory. *See Bloomstein*, 1998 U.S. LEXIS 20839, at *20-25; *see also, e.g., In re Lowry*, 32 F.3d at 1583-1584, 32 U.S.P.Q. 2d at 1034-1035.

In the subject application, claim 29, as amended, claims functional descriptive material recorded on a computer-readable medium and is therefore a patentable invention.

Claim 29, as amended, recites: a first data field related to a size parameter for a queue associated with a round of requests; and a second data field related to a ***maximum latency period*** for servicing a round of requests to update a storage medium, ***the maximum latency period is determined based upon at least one of the round of requests and the size parameter.***

The data structure of claim 29 is stored on a computer-readable medium. The data structure is also useful as it aids in the implementation of the system of claim 1 and increases computer efficiency.

Further, the data structure, comprising a first data field and second data field,

consists of functional descriptive material. The first data field functionally interrelates to the disk scheduling system of claim 1, as the first data field relates to the size parameter for a queue associated with a round of requests, as is found in the system of claim 1. The period of time necessary to service a round of requests is a function of the size parameter for the queue. Thus, the first data field is utilized to tell the disk scheduling system the number of requests in a round so that a period of time to service those requests can be determined.

The second data field functionally interrelates both with the first data field and the system of claim 1. The second data field functionally interrelates to the first data field (and thus, the system of claim 1) in that the second data field relates to a maximum latency period for servicing a round of requests to update the storage medium where the maximum latency period may be determined based upon the size parameter of the first data field. The second data field also functionally interrelates to the system of claim 1 directly in that it relates to a maximum latency period for servicing a round of requests to update the storage medium, as is found in the system of claim 1. The second data field is utilized to enable the disk scheduling system to have information as to the maximum latency period for servicing the round of requests to update the storage medium, so that the disk scheduling system can update the storage medium within the maximum latency period.

Based on the above, claim 29 recites subject matter that, as a whole, has been reduced to a practical application that is useful, as it aids in the implementation of system 1 and increases computer efficiency. *See Lowry, supra*. It is believed that claim 29 is in condition for allowance, and the rejection of this claim should be withdrawn.

III. Rejection of Claims 1, 4, 5, 19-20, 25-27, 29 Under 35 U.S.C. § 102(b)

Claims 1, 4, 5, 19-20, 25-27 and 29 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Kamel, *et al.* (US 6,078,998). It is requested that these rejections be withdrawn for at least the following reason: Kamel *et al.* does not describe each and every element recited in the subject claims.

For a prior art reference to anticipate, 35 U.S.C. §102 requires that “*each and every element*” as set forth in the claim is found, either expressly or inherently described, in a

single prior art reference.” *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950 (Fed. Cir. 1999) (quoting *Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)) (emphasis added).

Applicants’ claimed invention relates to a disk scheduler that facilitates I/O access to a computer storage medium in a predictable and efficient manner. (Application, page 4, lines 21-22) The claimed invention balances considerations of I/O access time and latency (e.g., placing bounds on the limits of I/O access) with considerations of other data scheduling tasks (e.g., classifying levels of I/O access data tasks in terms of importance). (Application, page 4, line 28 - page 5, line 1). The claimed invention provides latency boundaries to promote high performance of time-critical applications having periodic data such as audio and visual streams (e.g., multimedia applications) and manages data access for other applications (e.g., lower priority I/O tasks associated with aperiodic data). (Application, page 5, lines 1-5).

In particular, independent claim 1, as amended, recites the following limitation: a scheduling component that ***employs a predetermined number of the requests within a round of scanning the storage medium to provide a maximum latency period*** for servicing the requests within the round, ***the maximum latency period is determined based on number of requests within the round, and reorders the requests to optimize scheduling of the requests to maintain an optimal throughput level*** in connection with storage medium updates. Kamel *et al.* does not disclose important and distinctive aspects of the claimed invention.

In addition, independent claims 19, 20, 25 and 29 of the invention as claimed contain limitations similar to the above-stated limitation of independent claim 1.

Kamel *et al.* does disclose or suggest each and every element of claim 1 of the subject application. Kamel *et al.* relates to real time scheduling of prioritized disk requests. Kamel *et al.* is silent as to a scheduling component that sets a maximum latency period for servicing a round of requests to update a storage medium, where that maximum latency period is determined based on the predetermined number of requests within the round, and reorders the requests in an efficient order within the round so as to maintain high throughput level to the storage medium.

Rather, Kamel *et al.* teaches a system wherein, when a request is inserted into the

request queue, the system will attempt to service the requests in the queue, unless the deadline of a request in the queue is exceeded given the current order. (Kamel *et al.*, column 6, lines 23-35) If the deadline would be exceeded, the request processor will reorder the queue based upon priority and deadline data provided to the system. (Kamel *et al.*, column 6, lines 32-35) If a low priority request cannot be serviced by its deadline, that request will be dropped. (Kamel *et al.*, column 6, lines 59-62)

In fact, unlike the claimed invention, the system in *Kamel et al.* **does not update the storage medium by servicing a round of requests**. In Kamel *et al.*, when one request is transferred to the storage medium, another request may be placed in the queue, and the queue is again evaluated to see if the requests currently in the queue can be serviced in their current order; and this process continues, as stated. (See, e.g., Kamel *et al.*, column 2, lines 45-67; column 7, lines 1-7)

The claimed invention provides for a **disk-scheduling system that provides for a maximum latency period to service a round of requests to the storage medium**. The maximum latency period is determined based on the number of requests within the round. This ensures that periodic requests (e.g., multimedia-related requests) are timely serviced to update the storage medium to maintain high performance of time-critical applications (e.g., multimedia applications). (Application, claim 1, as amended; see also Application, page 4, line 25 – page 5, line 5) Further, **during each round of requests, the system also reorders the requests within the round in an efficient order** to optimize scheduling of the requests so as to maintain a high throughput level to the storage medium. (Application, claim 1, as amended; see also Application, page 2, lines 13-17; page 3, lines 5-8) Moreover, unlike Kamel *et al.*, in the claimed invention, **after a request within a round is serviced, the system does not cause a new request to be inserted and further cause the requests in the queue to again be evaluated**. Rather, the entire round of requests is serviced to update the storage medium, and then a new round of requests is inserted and evaluated.

The claimed invention thus achieves high overall performance for general purpose operating systems that also host multimedia applications involving periodic data requests. (Application, page 2, lines 13-17; page 3, lines 5-8; and claim 1, as amended)

For the foregoing reasons, Kamel *et al.* does not disclose or suggest each and every element of independent claims 1, 19, 20, 25 and 29 (and associated dependent

claims 4, 5, 26 and 27). Accordingly, it is believed that these claims are in condition for allowance, and the rejections as to these claims should be withdrawn.

IV. Rejection of Claims 2-3, 6-17, 21-23, & 28 Under 35 U.S.C. § 103(a)

Claims 2-3, 6-17, 21-23, & 28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kamel *et al.* (US 6,078,998) in view of Wooten *et al.* (US 5,621,898). It is requested that these rejections be withdrawn for at least the following reason. Kamel *et al.* and Wooten *et al.*, alone or in combination, do not disclose, teach, or suggest applicants' claimed invention.

Claims 2-3 and 6-17 depend from independent claim 1. Claims 21-23 depend from independent claim 20. Independent claim 28, as amended, contains limitations similar to those found in independent claim 1. Wooten *et al.* fails to cure the aforementioned deficiencies of Kamel *et al.* as to independent claims 1 and 20. Thus, it is believed that claims 2-3, 6-17, 21-23 and 28 are in condition for allowance, and the rejections as to these claims should be withdrawn.

CONCLUSION

The present application is believed to be in condition for allowance in view of the above comments and amendments. A prompt action to such end is earnestly solicited.

In the event any fees are due in connection with this document, the Commissioner is authorized to charge those fees to Deposit Account No. 50-1063 [MSFTP488USA].

Should the Examiner believe a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact applicants' undersigned representative at the telephone number below.

Respectfully submitted,

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